BUILDING SERVICES IN FACILITY MANAGEMENT

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor Degree of Civil Engineering

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Pengurusan Kemudahan (FM) biasanya sukar dan rumit. Kakitangan kemudahan biasanya menggunakan kertas atau sistem maklumat untuk merekodkan kerja penyelenggaraan kemudahan. Walau bagaimanapun, tidak mudah bagi kakitangan kemudahan untuk merujuk ilustrasi maklumat tradisional berasaskan CAD 2D dalam penyelenggaraan kemudahan. Selain itu, maklumat penyelenggaraan kemudahan yang sama perlu mengulang rekod dan menyebabkan ketidaknyamanan bagi kakitangan kemudahan. Untuk mengatasi masalah ini, pendekatan pemodelan maklumat bangunan (BIM) digunakan dan dibangunkan sebagai model maklumat 3D untuk mengurus dan mengekalkan kemudahan dalam kajian. Dengan penyepaduan model BIM dengan maklumat berkaitan penyelenggaraan kemudahan, kakitangan kemudahan dapat meningkatkan kecekapan penyelenggaraan dan pengurusan fasilitas. Kajian ini mencadangkan pengurusan kemudahan (FM) berdasarkan sistem pemodelan maklumat bangunan untuk pengurus dan kakitangan kemudahan. Sistem ini kemudiannya digunakan dalam kajian kes terpilih Kolej Kediaman 4 (KK4) untuk mengesahkan metodologi yang dicadangkan dan menunjukkan keberkesanan pengesanan dan pengurusan maklumat penyelenggaraan berkaitan dalam persekitaran 3D. Akhirnya, kajian ini akan membentangkan manfaat, batasan dan kesimpulan aplikasi BIM dalam pengurusan kemudahan, dan juga memberi cadangan untuk penyelidikan masa depan.

ABSTRACT

Facilities management (FM) usually is difficult and complicated work. The facility staffs usually use paper or information system to record the facilities maintenance work. However, it is not easy for facility staffs to refer the traditional 2D CAD-based information illustration in the facility maintenance. Moreover, the information of same facilities maintenance needs to repeat the record and cause inconvenience for facility staffs. To overcome these problems, the building information modelling (BIM) approach is applied and developed as 3D information models for managing and maintaining facilities in the study. With the integration of BIM model with related information of facilities maintenance, the facility staffs may improve the efficiency of maintenance and management work of facilities. This study proposes a facility management (FM) based on building information modelling system for facility managers and staffs. The system is then applied in selected case study of a Kolej Kediaman 4 (KK4) to verify our proposed methodology and demonstrate the effectiveness of tracking and managing the related maintenance information in the 3D environment. Finally, this study will present the benefits, limitations and conclusions of BIM application in facilities management, and also provide suggestions for future research.

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LIST OF ABBREVIATIONS

FM	Facility Management
BIM	Building Information Modelling
3D	Three Dimension
2D	Two Dimension
4D	Four Dimension
IT	Information Technology
CAD	Computer Aided Design
KK4	Kolej Kediaman 4
UMP	Universiti Malaysia Pahang
UMPH	Universiti Malaysia Pahang Holdings
AEC	Architecture Engineering and Construction
WO	Work Order
CAFM	Computer-Aided Facility Management
O&M	Oil and Maintainance

CHAPTER 1

INTRODUCTION

1.1 Introduction

The concept of Facility management (FM) is expanding and has become an important part of the construction and maintenance industries worldwide as globalization's impact on business and on the growth of related professionals and organizations increases. Today Facility management as a profession is much more accepted and recognized than in 1999 (David G. Cotts, Kathy O. Roper, and Richard P. Payant, 2010).

Facility management, defined as a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process, and technology, allows stakeholders to secure an important part of the design, construction and maintenance process due to various advantages like cost savings, increasing the life and quality of a facilities and simplifying methods of maintaining facilities (David G. Cotts, Kathy O. Roper, and Richard P. Payant, 2010).

Facilities management (FM) represents one of the fastest growing sectors in real estate and construction. To benefit most, organizations need to understand that they must be informed clients in managing their facilities and properties. However, tracking and managing facility effectively are extremely difficult owing to the various facilities. Real time monitoring and control for maintenance management may be necessary and helpful to control and manage effectively the maintenance work in the building facilities.

To enhance maintenance management performance, the building information modeling (BIM) approach is applied and developed as 3D information models for

managing and maintaining facilities in the study. With the integration of BIM model with related information of facilities maintenance work, the facility maintainers may improve the efficiency of maintenance and management work of facilities. With the assistance of the BIM approach, facility-based maintenance management information enables information dissemination and information sharing in the 3D environment.

This study addresses application of facility management in the maintenance phase and proposes a BIM based on Facility Management system for facility managers and staffs. The BIM based on FM is then applied for building of a Kolej Kediaman 4(KK4) to verify our proposed methodology and demonstrate the effectiveness of tracking and managing the related maintenance information in the 3D environment. By developing FM system, facility managers can track and manage the related maintenance record in the 3D environment.

1.2 Background of Study

Building Information Modelling (BIM) is the process of data generation and management of an asset during the stages of design, construction, facility and operation management, and demolition with the intention of maximizing efficiency and reducing costs in the AEC field (Lee et al., 2005). In this study, the BIM is interpreted as an information model in the BIM. The primary purpose of this study is to extend BIM into the maintenance phase and to create a single repository of facility data for facilities maintenance.

The application of utilizing BIMs to capture and store information of facilities thought to 3D BIM model including facing problem description of facilities, facilities maintenance information, and attaching documents in the BIM.

Generally, facility managers and staffs require access to the facility location to handle inspection and maintenance work at any facility locations. Facility staffs generally use sheets of paper and/or field notes. Facility staffs generally handle various types of information, including 2D drawings information for inspection and maintenance.

However, it is not easy for facility staffs to refer the traditional 2D CAD-based information illustration in the facility maintenance.

Information technology (IT) is important in successfully controlling and managing construction projects, particularly in enhancing communication and coordination among participants. Communication and coordination must be maintained to support resource and competency sharing among the involved participants. This paper proposes a new and practical methodology to capture and represent facility management information by using Building Information Modeling (BIM) approach.

Building Information Modeling (BIM) is a new technology in the field of CAD, which contains not only geometric data, but can accommodate great amount of engineering data over the lifecycle of a building (Xudong and Jie 2007). According to Khemlani (2010), BIM is a revolutionary technology that goes well beyond the design phase to impact construction and lifecycle management of the project. BIM can be used in the preconstruction phase in cost and quantity estimates, and in integration and coordination among building components and their scheduling data. It can also be used as a life cycle information management process for safety planning (Sulankivi et al. 2010). Elbeltagi and Dawood (2011) developed a time control model for repetitive construction projects based on BIM technology.

1.3 Problem Statement

BIM is interpreted as an information model in the FM. The primary purpose of this study is to extend BIM into the maintenance phase and to create a single repository of facility data for facilities maintenance. Furthermore, the application of utilizing BIMs to capture and store information of facilities thought to 3D BIM model including facing problem description of facilities, facilities maintenance information, and attaching documents.

This case is applied in the Kolej Kediaman 4 maintenance work. The facility department hopes to enhance maintenance management performance using full

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